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Frequency Variability of Electron Acoustic Waves.[1] F. ANDEREGG, D.H.E. DUBIN, T.M. O'NEIL, C.F. DRISCOLL, UCSD — "Electron Acoustic Waves" (EAW) are non-linear electrostatic plasma modes, with a phase velocity comparable to the thermal velocity[2] $v_\phi \approx 1.3\bar{v}$. EAWs can be excited in neutralized plasmas,[3] pure electron plasmas and pure ion plasmas. Here, we present measurements of the "thumb shape" dispersion relation of EAW and Trivelpiece-Gould (TG) plasma modes in a pure magnesium ion plasma. Near the end of the thumb ($r_p/\lambda_D < 3$), modes can be excited at almost any frequency, contrasting with the theoretical dispersion relation. The surprise here is that an "off-resonant" drive readily modifies the velocity distribution so as to make the drive *resonant*. These plasma modes can also be excited by a chirped down frequency burst, similar to the one described by the Berkeley group.[4] The chirped excitation creates extreme modification of $f(v_z)$, and can be tailored to support a plasma mode at almost any frequency. We also observe that the resonant frequency of both EAW and TG plasma modes decreases with mode amplitude, in a fully reversible manner; but this effect has no theoretical explanation.

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[2]F. Valentini et al., *Phys. Plas.* **13**, 052303 (2007).
[3]Sircombe et al., *Plas. Phys. Cont. Fus.* **48**, 1141 (2006).
[4]Bertsche et al., *Phys. Rev. Lett.* **91**, 265003 (2003).

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